

What is claimed is:

- 1 1. An isolated DNA comprising:
 - 2 (a) a nucleic acid sequence that encodes a polypeptide with the ability to co-

3 stimulate a T cell, wherein the nucleic acid sequence hybridizes under stringent conditions to

4 the complement of a sequence that encodes a polypeptide with an amino acid sequence with

5 SEQ ID NO:5; or

6 (b) the complement of the nucleic acid sequence.
- 1 2. The DNA of claim 1, wherein the nucleic acid sequence encodes a

2 polypeptide comprising an amino acid sequence with SEQ ID NO:5.
- 1 3. The DNA of claim 1, wherein the nucleic acid sequence has a sequence of

2 SEQ ID NO:6.
- 1 4. An isolated co-stimulatory polypeptide encoded by the DNA of claim 1.
- 1 5. The isolated polypeptide of claim 4, wherein the polypeptide comprises an

2 amino acid sequence of amino acid residue 31 to amino acid residue 282 of SEQ ID NO:5, or

3 said amino acid sequence but with one or more conservative substitutions.
- 1 6. The isolated polypeptide of claim 5, wherein the polypeptide comprises an

2 amino acid sequence of SEQ ID NO:5, or said amino acid sequence but with one or more

3 conservative substitutions.
- 1 7. A vector comprising the DNA of claim 1.
- 1 8. The vector of claim 7, wherein the nucleic acid sequence is operably

2 linked to a regulatory element which allows expression of said nucleic acid sequence in a

3 cell.
- 1 9. A cell comprising the vector of claim 7.
- 1 10. A method of co-stimulating a T cell, the method comprising contacting the T

2 cell with the polypeptide of claim 4.

1 11. The method of claim 10, wherein the contacting comprises culturing the
2 polypeptide with the T cell *in vitro*.

1 12. The method of claim 10, wherein the T cell is in a mammal.

1 13. The method of claim 12, wherein the contacting comprises administering the
2 polypeptide to the mammal.

1 14. The method of claim 12, wherein the contacting comprises administering a
2 nucleic acid encoding the polypeptide to the mammal.

1 15. The method of claim 12, comprising:

2 (a) providing a recombinant cell which is the progeny of a cell obtained from the
3 mammal and has been transfected or transformed *ex vivo* with a nucleic acid encoding the
4 polypeptide so that the cell expresses the polypeptide; and

5 (b) administering the cell to the mammal.

1 16. The method of claim 15, wherein the recombinant cell is an antigen presenting
2 cell (APC) and expresses the polypeptide on its surface.

1 17. The method of claim 16, wherein, prior to the administering, the APC is
2 pulsed with an antigen or an antigenic peptide.

1 18. The method of claim 15, wherein the cell obtained from the mammal is a
2 tumor cell.

1 19. The method of claim 12, wherein the mammal is suspected of having an
2 immunodeficiency disease.

1 20. A method of identifying a compound that inhibits an immune response, the
2 method comprising:

3 (a) providing a test compound;

4 (b) culturing, together, the compound, the polypeptide of claim 4, a T cell, and a
5 T cell activating stimulus; and

6 (c) determining whether the test compound inhibits the response of the T cell to
7 the stimulus, as an indication that the test compound inhibits an immune response.

1 21. The method of claim 20, wherein the stimulus is an antibody that binds to a T
2 cell receptor or a CD3 polypeptide.

1 22. The method of claim 20, wherein the stimulus is an alloantigen or an antigenic
2 peptide bound to a major histocompatibility complex (MHC) molecule on the surface of an
3 antigen presenting cell (APC).

1 23. The method of claim 22, wherein the APC is transfected or transformed with a
2 nucleic acid encoding the polypeptide and the polypeptide is expressed on the surface of the
3 APC.

1 24. A method of identifying a compound that enhances an immune response, the
2 method comprising:

3 (a) providing a test compound;

4 (b) culturing, together, the compound, the polypeptide of claim 4, a T cell, and a
5 T cell activating stimulus; and

6 (c) determining whether the test compound enhances the response of the T cell to
7 the antigen, as an indication that the test compound enhances an immune response.

1 25. The method of claim 24, wherein the stimulus is an antibody that binds to a T
2 cell receptor or a CD3 polypeptide.

1 26. The method of claim 25, wherein the stimulus is an alloantigen or an antigenic
2 peptide bound to a MHC molecule on the surface of an APC.

1 27. The method of claim 26, wherein the APC is transfected or transformed with a
2 nucleic acid encoding the polypeptide and the polypeptide is expressed on the surface of the
3 APC.

1 28. An antibody that binds specifically to the polypeptide of claim 4.

1 29. The antibody of claim 28, wherein the antibody is a polyclonal antibody.

1 30. The antibody of claim 28, wherein the antibody is a monoclonal antibody.

1 31. The antibody of claim 28, wherein the antibody binds to the polypeptide with
2 SEQ ID NO:5.

1 32. A cell comprising the vector of claim 8.

1 33. A method of producing a polypeptide that co-stimulates a T cell, the method
2 comprising culturing the cell of claim 32 and purifying the polypeptide from the culture.

1 34. A fusion protein comprising a first domain joined to at least one additional
2 domain, wherein the first domain comprises a polypeptide of claim 4.

1 35. The fusion protein of claim 34, wherein the at least one additional domain
2 comprises the constant region of an immunoglobulin heavy chain or a fragment thereof.

1 36. A nucleic acid molecule encoding the fusion protein of claim 35.

1 37. A vector comprising the nucleic acid molecule of claim 36.

1 38. The vector of claim 37, wherein the nucleic acid molecule is operably linked
2 to a regulatory element which allows expression of the nucleic acid molecule in a cell.

1 39. A cell comprising the vector of claim 38.

1 40. A method of producing a fusion protein, the method comprising culturing the
2 cell of claim 39 and purifying the fusion protein from the culture.

1 41. A method of co-stimulating a T cell, the method comprising contacting the T
2 cell with:

3 (a) a first co-stimulatory polypeptide selected from the group consisting of
4 (i) B7-H1, (ii) B7-H2, (iii) B7-H3, (iv) B7-H4, (v) a functional fragment of any of (i) - (iv),
5 and (vi) any of (i) - (v) but with one or more conservative substitutions; and

6 (b) one or more additional co-stimulatory polypeptides selected from the group
7 consisting of (vi) B7-1, (vii) B7-2, (viii) B7-H1, (ix) B7-H2, (x) B7-H3, (xi) B7-H4, (xii) a
8 functional fragment of any of (vi) - (xi), and (xii) any of (vi) - (xii) but with one or more
9 conservative substitutions.

1 42. The method of claim 41, wherein the contacting comprises culturing the first
2 co-stimulatory polypeptide and the one or more additional co-stimulatory polypeptides with
3 the T cell *in vitro*.

1 43. The method of claim 41, wherein the T cell is in a mammal.

1 44. The method of claim 43, wherein the contacting comprises administering the
2 first co-stimulatory polypeptide and the one or more additional co-stimulatory polypeptides
3 to the mammal.

1 45. The method of claim 43, wherein the contacting comprises administering one
2 or more nucleic acids encoding the first co-stimulatory polypeptide and the one more
3 additional co-stimulatory polypeptides to the mammal.

1 46. The method of claim 43, comprising:

2 (a) providing a recombinant cell which is the progeny of a cell obtained from the
3 mammal and which has been transfected or transformed *ex vivo* with one or more nucleic
4 acids encoding the first co-stimulatory polypeptide and the one or more additional
5 polypeptides so that the cell expresses the first co-stimulatory polypeptide and the one or
6 more additional co-stimulatory polypeptides; and

7 (b) administering the cell to the mammal.

1 47. The method of claim 43, comprising;

2 (a) providing a first recombinant cell which is the progeny of a cell obtained from the
3 mammal and which has been transfected or transformed *ex vivo* with a nucleic acid encoding
4 the first co-stimulatory polypeptide;

5 (b) providing one or more additional recombinant cells each of which is the progeny
6 of a cell obtained from the mammal and each of which has been transfected or transformed
7 *ex vivo* with a nucleic acid encoding one of the additional one or more co-stimulatory
8 polypeptides; and

9 (c) administering the first cell and the one or more additional cells to the mammal.

1 48. The method of claim 46, wherein the recombinant cell is an antigen presenting
2 cell (APC) and expresses the first co-stimulatory polypeptide and the one or more additional
3 co-stimulatory polypeptides on its surface.

1 49. The method of claim 48, wherein, prior to the administering, the APC is
2 pulsed with an antigen or an antigenic peptide.

1 50. The method of claim 46, wherein the cell obtained from the mammal is a
2 tumor cell.

1 51. The method of claim 43, wherein the mammal is suspected of having an
2 immunodeficiency disease.

1 52. The method of claim 10, wherein the polypeptide co-stimulates the production
2 of interferon- γ by the T cell.

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